

In the Abstract:

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ABSTRACT

The present invention relates to the use of ozone (O_3) as a reagent in chemical mechanical planarization either in aqueous solution or as a gas directly impinging on the surface to be planarized. An aqueous solution containing ozone may optionally contain abrasive particles and/or additional CMP reagents co-dissolved with the ozone including carbonate and bicarbonate anions, and organic acids such as formic, oxalic, acetic and glycol. Abrasives that may be added include alumina, silica, spinel, ceria, and zirconia. Typical concentrations of ozone in aqueous solution are in the range from approximately 1 part-per-million up to saturation. Ammonium salts, particularly ammonium carbonate, facilitate planarization in cooperation with the ozone-containing aqueous solution. Low k dielectric materials, organic as well as inorganic, and difficult to oxidize metals can be planarized with ozone reagents pursuant to the present invention.